BULIMULUS DAMARENSIS, H. Ad. (Plate I. fig. 17.)

B. *testa vix rimata, oblonga, solida, longitudinaliter plicoso-striata, plicis obtusis, subarcuatis, albida, interdum strigis corneo-fuscis ornata; spira superne attenuata, apice obtuso, corneo; anfr.* $10\frac{1}{2}$, *convexiusculis, ultimo* $\frac{1}{3}$ *longitudinis æquante; apertura subovali, basi angulata; perist. recto, calloso, marginibus callo junctis, columellari dilatato, appresso.*

Long. 24, lat. 9 mill.

Hab. Damara Land (*Coll. H. Ad.*).

This species is allied to *B. tauricus*, Lang., but differs from it in being less rimate, and in the spire being attenuated at the upper part.

BULIMULUS PYGMÆUS, H. Ad. (Plate I. fig. 18.)

B. *testa rimato-perforata, ovata, solida, alba, striis longitudinalibus et spiralibus minutissimis obsolete decussata; spira brevi, convexo-conica, apice obtuso, sutura impressa; anfr.* 6, *convexis, ultimo* $\frac{1}{2}$ *longitudinis æquante; columella subverticali; apertura ovali; perist. recto, crasso, margine columellari arcuato, dilatato, reflexo, perforationem subtegente.*

Long. 13, diam. 8 mill.

Hab. Damara Land (*Coll. H. Ad.*).

DESCRIPTION OF PLATE I.

Figs. 1, 1*a*. *Nesta candida*, p. 5.
2. *Corbula sulculosa*, p. 6.
3. *Tellina* (*Tellinella*) *virgulata*, p. 6.
4. *Tellidora pusilla*, p. 6.
5. *Lucinopsis* (*Lajonkairia*) *elegans*, p. 6.
6. *Semele macandreæ*, p. 6.
7. *Chione pulchella*, p. 7.
8. *Loripes decussata*, p. 7.
9. *Perna fulgida*, p. 7.
Fig. 10. *Limopsis concinna*, p. 7.
11. *Limæa pectinata*, p. 7.
12. *Melanoides swinhoei*, p. 8.
13. *Bithynia robusta*, p. 8.
14. *Rumina* (*Subulina*) *teres*, p. 8.
15. *Helix* (*Camæna*) *hainanensis*, p. 8.
16. *Pterocyclos hainanensis*, p. 8.
17. *Bulimulus damarensis*, p. 9.
18. —— *pygmæus*, p. 9.

2. Description of a new Generic Type of Entozoon from the Aard Wolf (*Proteles*); with Remarks on its Affinities, especially in reference to the question of Parthenogensis. By T. S. COBBOLD, M.D., F.R.S., F.L.S.

On the 4th of November last I received from Professor Flower, F.R.S., a small bottle containing some Nematode worms, accompanied by a letter stating that the parasites had been "found loose in the peritoneal cavity of *Proteles cristatus*." The mere circumstance that the carnivorous "host" had never before been properly anatomized, naturally led Mr. Flower to suppose that the worms would prove new to science; and this inference could hardly fail to be strengthened by the rather uncommon fact of the occurrence of

round worms in large numbers in the general serous cavity of the abdomen. Moreover there had to be taken into consideration the peculiarities of the digitigrade mammal thus infested, its comparative rarity, and also its limited area of geographical distribution, these several influences being unquestionably concerned in the "fixation," so to speak, of the specific form likely to be encountered. It is not surprising therefore that our anticipations in the above relation should have been more or less completely verified; and accordingly it turns out that we here encounter a new genus of internal parasites offering peculiarities of structure, and apparently also of habit, which on the whole suggest a slight approximation to the ordinary filarine genera, on the one hand, but with a closer connexion with the remarkable genus *Dracunculus* on the other. When all the facts bearing upon the genetic relations of the Guinea-worm come to be fully known, it may then turn out that my determinations, in respect of the affinities of the new worm, are somewhat wide of the mark; but, in the meantime, the following data will show the grounds on which I have provisionally asserted this alliance. All the specimens received by me, thirty-four in number, were females; therefore, in the absence of any knowledge of the corresponding male parasites, the following characters must be regarded as applicable only to one of the sexes:—

Order NEMATODA, Rud.

Suborder Nem. Proctucha, Dies.

Family Filaridea, Dies.

Subfamily Cheilonemidia, Dies.

Acanthocheilonema, g. n.

Head furnished with three spinous lips; body filiform; female endoparasitic in mammals.

A. dracunculoides, sp. n.

Body smooth, finely attenuated in front, uniformly thick below; head sharply pointed when the lips are closed, obtuse when exserted; neck spirally twisted in four or five circles; tail abruptly truncate, with a solitary, central, very slightly projecting lobe; no reproductive orifice visible.

Length $1\frac{1}{4}''$ to $2\frac{1}{2}''$; general breadth $\frac{1}{90}''$ to $\frac{1}{80}''$.

This combined generic and specific description, though sufficient for future identifications, may, I think, be profitably supplemented by other particulars relating to size, external form, and general organization, amongst which I have remarked the following:—The head immediately beneath the insertion of the lips measures so little as the $\frac{1}{1000}''$ in diameter, whilst the neck proper gives only twice the same amount of thickness. The tail is fully $\frac{1}{90}''$ in breadth, its feebly pronounced central lobe being no more than the $\frac{1}{260}''$ wide at the base. The mature eggs, or those containing more or less per-

fected embryos, present an average length of $\frac{1}{750}''$ by $\frac{1}{830}''$ in width; but the fully developed embryos, when set free and unrolled, give an average measurement of $\frac{1}{115}''$ from head to tail. The larvæ, however, are remarkably thin, the longest of them not exceeding the $\frac{1}{3000}''$ in thickness; yet, notwithstanding their smallness, they have already attained the general form of their parents, the finely pointed anterior extremity of the body scarcely exceeding the $\frac{1}{10,000}''$ in diameter. In this connexion, I must also not omit to mention that on removing the batch of parent worms from the phial in which they were sent, I observed several of them to be adhering to one another, the various points of union being marked by the presence of minute particles of débris. To the naked eye these particles presented a pale yellow colour, their irregular outline and general aspect suggesting that they were only patches of mucus, connective tissue, or something of that sort derived from the "host" during dissection. However, to my astonishment, on microscopically examining one of these little masses, measuring about the $\frac{1}{20}''$ in length, I found it to consist of thousands of embryos agglutinated together. So consolidated had they become by the action of the spirit in which they were preserved, that I had the greatest difficulty in isolating any one of them; and since, also, they were, individually, much shrivelled and twisted, their measurements could not be very accurately taken. Making all due allowance for contractions and alterations of shape, I did not find that their separate total lengths perceptibly exceeded that of the embryos obtained from the interior of the parent worms. In the mass they were coiled upon themselves and each other in inextricable confusion. I purposely dwell upon these apparently trivial matters because it seems to me of the highest importance to ascertain whether the escaped embryos were, or were not, caught in the act of migrating. They may have accumulated only as the result of accidental evacuation from specimens of the parent worms injured during the dissection of the "host;" in this case, however, though the egg-envelopes would naturally have disappeared, I should probably have noticed some of the freed embryos in a less perfectly developed condition than that in which all of them actually appeared to be. Those who are acquainted with the migratory habits of the Nematode Entozoa will readily conclude that these embryos were, at the time of the "host's" death, accomplishing what, in other cases, has been appropriately termed a "first active wandering" on their own account; and probably a passive transference to some unknown intermediary bearer would, had they lived, have been essential to the further development of these particular larvæ. Be that as it may, in the matter of ascertaining their mode of actual escape (supposing them to have obtained their freedom naturally) there yet remains the rather awkward circumstance that I have not yet succeeded in procuring evidence of the existence of any reproductive outlet in the body of the parent worm.

In establishing a new genus for the reception of this interesting form of Entozoon, some explanation is certainly necessary. At once, therefore, I may remark that I should have preferred to designate

the genus as *Tricheilonema*; and, indeed, I had already so written it, when I afterward found that the late C. M. Diesing had already employed the same generic title for a parasite of a somewhat different type. In his final revision of the Nematoda, communicated to the Vienna Academy in 1860, he places this Nematode (described in his 'Systema Helminthum' as a species of *Filaria*) as the type of his new genus *Tricheilonema*; whilst, unfortunately, in the Introduction or Conspectus of the same revision, this genus, *Tricheilonema*, appears under the synonym of *Schizocheilonema*. This complication of terms is vexatious—the more so since his term *Tricheilonema* would have been much more suitable for the designation of our new parasite than for the particular form of *Filaria* there described as having been obtained from the œsophagus of an Austrian Snake. On the other hand, since Diesing's ready method makes no pretentions towards a natural classification of the Entozoa, and since, also, in the present state of our knowledge, it is much more convenient to utilize his system of arrangement than those of other systematists, there is the less reason to regret the necessary introduction of a new generic term. If Schneider's system be more natural, it is, at all events, much less complete. Without further apology, therefore, on this score, I may also remark upon the great difficulties surrounding a natural classification of the parasitic Nematodes. The variety of characters they display, especially at different stages of their growth, the remarkable disparity of size occasionally shown by the sexes, to say nothing of the still more astonishing fact that the adult female Entozoon may itself occur in two totally distinct forms—all these peculiarities, not to mention many others (associated with or depending upon their migratory habits), add to the difficulties of taxonomy. These instances of dimorphism, it is true, are now no longer believed to be confined to the Nematode Entozoa, certain Entomostraca, Aphides, and Bees; nevertheless the recent additions on this head are mainly a confirmation of the remarkable discoveries of Leuckart and Mecznikow in respect of the life-phases and development of *Ascaris nigrovenosa*. In this connexion one may particularize the observations of Prof. Leuckart respecting sexual dimorphism as it occurs in *Coccus* and in *Chermes*, of Prof. Häckel, who finds the naked-eyed *Geryoniadæ* capable of producing (from the walls of the stomach) medusoids totally unlike their parents, and of Prof. Claus in respect of the Nematode *Leptodera appendiculata*. It was reserved, however, for Prof. Claparède to discover proofs of the existence of similar phenomena amongst the Annelids properly so called. By a recently published brochure (which the author has kindly sent me), I gather that the occurrence of two distinct sexual forms presented by *Nereis dumerilii* does something more than confirm the statements of the above-named authorities, since the dimorphic phases of this singular Annelid have something about them altogether peculiar, if not unique*. The sexually mature *Nereis*, we are told, loses for a time its sexuality, increases in size

* Recherches sur des Annélides (p. 38). Tiré des Arch. des Sci. de la Bibl. Univ. Oct. 1869.

and segmentation, then becomes sexual again, and ultimately has the power of transforming itself into a *Heteronereis*. This would signify little, perhaps, if the two phases were only slightly different in character; but it must be borne in mind that they represent type forms of genera hitherto regarded as utterly disconnected and entirely distinct. If Prof. Claparède's observations and conclusions should be verified and extended by further researches, we shall have fallen upon another page of fruitful discovery bearing upon the so-called law of "alternate generation." In touching upon these genetic phenomena, my object is to bring about a probable explanation in connexion with the development of the parasitic species now before us. From the first, my suspicions were roused by peculiarities of structure observable in *Acanthocheilonema* which forcibly reminded me of *Dracunculus*. Knowing as we do, to some extent, the sexual characteristics of this aberrant parasite, and keeping in view, at the same time, Prof. Schneider's interpretation of cognate facts displayed by the singular genus *Sphærularia*, it occurred to me that the characters exhibited by *Acanthocheilonema* afforded indications of a new and important link in the complex chain of Nematode affinities. Thus all the specimens I have examined are females; the oral, anal, and reproductive apertures are either entirely obliterated, or, from their closure and excessive minuteness, have escaped observation; whilst the whole parasite may be summarily described as an elongated sac, crammed from end to end with embryos in all stages of development. It should not be forgotten that, for a long time, the mouth and even the intestinal tract of *Dracunculus* escaped detection, and at the present hour (notwithstanding Bastian's remarkable discoveries in this relation) the existence of an anal outlet has not been actually demonstrated. The alimentary canal of *Acanthocheilonema* is visible throughout the greater part of its course, but not in the immediate vicinity of the head. One noticeable difference between the two genera consists in the fact that whereas in *Dracunculus* the embryos lie free in all stages of growth in the uterine cavity, in *Acanthocheilonema* they are still surrounded by a chorional envelope. Our new species is therefore an ovoviviparous Entozoon belonging, like *Dracunculus*, to that category of Nematodes which are parasitic only during the propagative state. It is, I believe, maintained by Schneider in the case of *Sphærularia* (his views, however, being opposed to those given by Sir John Lubbock in his admirable memoir on this genus), and by Bastian in the case of *Dracunculus*, that the mode of propagation in these worms is entirely asexual, this opinion having received the general support of Prof. Huxley. For my own part I wish to say that when, in 1864, with a full knowledge of the facts brought forward as regards the Guinea-worm, I offered a contrary interpretation of the phenomena, I did so from no other motive than that of honest conviction; and even now I hold that an exclusively agamogenetic mode of propagation for these worms cannot be successfully maintained. Keeping before us those recent and important additions to our knowledge to which I have here called attention, I am of opinion that *Dracunculus*, in the form commonly known, will

turn out to be but one of two phases of the same female, the parasitic, in contradistinction to the non-parasitic, form, having the power of reproducing agamogenetically. Probably it will eventually appear that other worms known to us only in the female condition are forms of this character. Provisionally I place *Sphærularia* and *Acanthocheilonema* in this category; and should my conception of their parthenogenetic relations be ultimately proven correct, we shall have arrived at the solution of many difficult problems which have been put forward by writers and investigators. For example, as regards the Guinea-worms, Prof. Bastian very naturally asks, "Why are females only discovered in the human body?" and again, "Is there one species of *Dracunculus* only, or are there many, corresponding with different species of microscopic Filaridæ?" If my interpretation of the facts be correct, these and suchlike questions are at once satisfactorily answered. If, as Carter supposes, *Urolabes palustris* be the progenitor of *Dracunculus medinensis*, there can be no impropriety in asserting a similar genetic relation for many allied forms. Not merely may we look to such antecedents in favour of the species already mentioned, but I have little hesitation in claiming a corresponding origin for the so-called "Loa" (*Dracunculus loa*, T. S. C.), which infests the eyes of Negroes of the Angola coast—and for the *Filaria* (*Dracunculus æthiopicus*, Dies.) of Valenciennes, found in the cellular tissue of the extremities and abdomen of a Carnivore from Cordofan (*Felis guttata*). Both of the above are known to science only in the female state; and the same may be said of many other filarine species whose origin, migratory habits, and final destinations necessarily remain, in the present state of our knowledge, a mere matter of conjecture. In conclusion, therefore, let me repeat that I regard *Acanthocheilonema* as a parthenogenetic female whose embryos probably gain access to the outer world by first entering the intestinal canal of the "host," ultimately passing out by the natural passages. In the free state, like *Rhabditis*, they probably give rise to a new progeny by the ordinary sexual process, all or part of this progeny becoming parasitic and parthenogenetic females.

3. Brief History of the Introduction of Salmon (*Salmo salar*) and other *Salmonidæ* to the Waters of Tasmania. By Morton Allport, F.Z.S., F.L.S.

In the year 1841 the late Mr. Frederick Chalmers, of Brighton in Tasmania, who was then Master of a vessel trading from London, applied to Dr. Mackenzie, of Kinellan, by Dingwall, Ross-shire, Scotland, with a view to obtaining Salmon-fry for transport to Tasmania. The fry were not obtained in time for the departure of the vessel, as appears by letters published in the 'Proceedings' of the Royal Society of Tasmania (vol. i. p. 281); and this abortive attempt would scarcely be worth recording but for the curious fact that even